Vaccination against influenza among medical students of selected Medical Universities in Poland in the 2014/2015 influenza season

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Abstract: Vaccinations against influenza are one of the most beneficial elements of prevention. Adoption of measures to popularize vaccination among reluctant to be vaccinated against influenza Polish population, especially in the environment of future doctors should be one of the priorities in the universities. The article analyzes the level of basic knowledge, opinions and declared behaviors related to influenza and its prevention among medical students of selected Medical University in Poland. The study included 1,031 individuals during the 2014/2015 epidemic. It represented a diverse population of sex, age, place of residence. For the purpose of the research an original questionnaire was used. The results were subjected to statistical analysis, which reveals that only 76 individuals got inoculated against influenza, which accounted for only 7.37% of the study population of students studying in various academic centers in Poland. Analysis of own research shows that regularly over the last five influenza seasons only 70 individuals (6.79%) have got inoculated, while the vast majority – 72.45% of the population did not get inoculated at all, and 20.75% occasionally declared inoculation against the influenza. Despite seasonal influenza epidemics, undertaken educational and preventive tests among vulnerable group rather a pessimistic picture emerges of the Polish population.

Key words: vaccination, prevention, influenza, diagnostic survey

Alergoprofil 2016, Vol. 12, Nr 4, 169-176
Received: 2016.11.24
Accepted: 2016.11.30

Introduction

A large genetic variation belonging to the RNA influenza viruses affects the occurrence of periodic epidemics and pandemics, leading to the death of a large number of individuals around the world. From WHO data it may be inferred that due to influenza virus infection and influenza-like illnesses each year worldwide have 5–25% of the population and because of the multi-organ complications 0.5–1 million individuals die [1]. Influenza viruses is caused by *Orthomyxoviridae* family. It spreads mainly by droplets through the spray of mucus containing viruses [2]. Infection can also occur through direct contact with objects contaminated with secretions from the respiratory system such as a sick person as cutlery or crockery. The greatest infectivity is showed by the sick in the symptomatic period of the infection. The influenza virus is excreted from the body from the moment of its propagation on the mucous membranes, just before onset of symptoms and during the whole period of the disease and it is the time where carriers may infect many other individuals [1]. Vaccinations against influenza have belonged to the recommended vaccinations for over 20 years – since 1994 in Poland. Regular seasonal influenza vaccination is such a form of protection of children, both young individuals and the elderly, which can protect against the potential risk of serious complications [3]. It should also be part of sound medical practice.

In comparison with the low level of vaccination against influenza (3.7% in the influenza season 2014/2015) in Poland, it seems necessary to take measures for the promotion of knowledge about the influenza and its complications and economic and social consequences especially among medical students, who will in future guard over the health of the Polish individuals. Students and health professionals, who themselves are little interested in vaccination are therefore have limited impact on the decision on vaccination to patients, although it is the opinion of current and future health care workers, should be essential for them. The European Commission (EC) on the basis of data provided by the European Centre for Disease Prevention and Control (ECDC) [4] and the World Health Organization (WHO) recommend vaccination as the most effective means of preventing illness on seasonal influenza and as a key intervention that allows to limit the impact of this disease on public health. In the population at risk for serious disease from the influenza, it is recommended that achievement rate of vaccination against influenza should be at 75% [5]. It is also recommended to perform influenza vaccination for health professionals, which also includes students of medical schools. It is suggested that reaching 75% of the population of the vaccinated health care workers would be the first step to implement vaccination to all health–care workers without medical contraindications to vaccinations [6]. The aim of the study was to investigate the level of knowledge on influenza and its complications prevention among students of the first year of medical studies of selected medical universities in Poland. This study was also to popularize knowledge about the dangers of influenza and the benefits arising from the use of preventive vaccination

Methods

The study was conducted in 2014/2015 influenza season among 1,031 students of the first year of medical studies Medical University in Gdansk, Krakow, Lublin, Lodz, Poznan, Szczecin, Warsaw and Wroclaw. The participation of respondents was voluntary, anonymous and free of charge. The only criterion for participation in the study was the fact of being a student at the Medical University in Poland.

Used diagnostic survey taking advantage of a questionnaire was developed by the authors. The survey included information about the scope and purpose of the study, the imprint, composed of the information on age, sex, place of residence, as well as 15 research questions divided into three sections.

1. Basic information about the fund of knowledge about the influenza virus and sources to be used.
2. Opinions on influenza and vaccination against influenza.
3. Motivations guiding students about influenza vaccination or their absence.

To establish a database and statistical calculations Microsoft Office Excel was used. Specific differences between groups of students were measured by Chi-square (Chi^2). Statistical inference was performed at a significance level of $p \leq 0.05$.

Results

The majority of respondents were 657 women (63.72%), men constituted a group of 374 individuals, which accounted for 36.28%, the average age of the individuals providing the answers in the survey was 20.8 years of age. The student population surveyed was diverse in terms of place of residence – 440 individuals (42.68%) came from provincial cities, 376 (36.47%) from smaller district towns and 215 individuals (20.85%) lived in rural areas. A mathematical analysis of the results of survey is presented in table 1. Declara-

Table 1. *Opinion on influenza and influenza vaccination among a selected group of Polish students.*

Analysed factor/opinion	Students getting inoculated against influenza	% participation among students getting inoculated against influenza	Students not getting inoculated against influenza	% participation among students not getting inoculated against influenza	Statistical calculations
The way of conveying information on vaccination and the vaccine					
Clearly enough conveyed by the media	19	2	134	13	p = 0.02
Not all is clearly presented by the media	51	5	686	67	
I have no opinion	6	1	135	13	
Sources from which students derive information on immunizations and vaccines against influenza					
Mass media	9	1	283	27	p = 0.0004
Scientific publications via Internet	13	1	227	22	
Family	22	2	140	14	
Medical personnel	30	3	251	24	
Other	2	1	54	5	
Knowledge of the influenza virus component which constitutes a vaccine against influenza					
The whole virion	5	1	40	4	p = 0.025
RNA of the virus	14	1	138	13	
Glycoproteins: hemagglutinin and neuraminidases	26	3	274	27	
I don't know	31	3	503	49	
The best ways to protect against influenza virus infection					
Prophylaxis with vaccination	60	6	241	23	p < 0.005
Analgesics and antipyretics	6	1	62	6	
Vitamin preparations	3		172	17	
Home ways: garlic, onion, honey, milk, etc.	5	1	343	33	
Drugs, vitamins, unconventional methods only alleviate the symptoms	2		137	13	
The opinion of the surveyed about influenza vaccination of pregnant women					
It's a good way of protecting a mother-to-be and her child	22	2	139	14	p < 0.001
It's a bad way	10	1	283	27	
I don't have an opinion	44	4	533	52	
The opinion of the surveyed about influenza vaccination of young children over 6 months of life					
It's a good way of protecting a child	26	2	234	23	p = 0.01
It's a bad way	7	1	222	22	
I don't have an opinion	43	4	499	48	

tion of vaccination against influenza provides statistically significant differences in the way these individuals present the knowledge about the virus, how information about immunizations and vaccine and available methods of prevention of influenza is conveyed. These individuals more often than individuals who declare no intention of vaccination deem vaccination as very important and indicate protection against influenza virus infection in pregnant women and young children over 6 months of age. Striking is the fact that 301 individuals from the group of 1,031 have an opinion that prevention with vaccines is the best form of protection against the influenza, but a little more than 7% is used as a form of vaccination prophylaxis. This reveals a very low level of knowledge and the wrong approach to the prevention of influenza caused by widely circulating in society stereotypes of "inoculated and sick" or "it does not make sense to vaccinate as I'll get sick anyway".

Analysis of our own studies involving more than a thousand students shows that regularly over the last five influenza seasons only 70 individuals representing 6.79% of the population, have got inoculated against the illness, while the vast majority of 747 individuals (72.45%) did not get inoculated at all or occasionally declared inoculation – 214 individuals (20.75%). Most students who got inoculated were from the Medical University of Poznan, while in Wroclaw, Cracow, Gdansk there were the fewest individuals willing to get inoculated. The groups of students in each academic center analyzed are shown in table 2.

Inoculation of the medical students with influenza shot at least once in the last five influenza seasons does not increase the likelyhood of taking vaccination for the season of 2014/2015. Declaration of 76 individuals vaccinated in the period and the declaration of vaccination at least 1 time in the last five influenza seasons at the level of 6.79% points to the fact that this decision among students is the same as those who are in favor of vaccination remember about seasonal vaccination while the vast majority avoiding vaccinations, claim that they fear the side effects (4.85%), have financial reasons (6.89%), they lack faith in the efficacy of vaccination and 100% protection against disease, (respectively 16.20% and 16.49%). This group has also a significant number of individuals who did not reply in general to this question constituted by 27.93%, 21.73% claimed that prophylactic vaccination is not a matter and 5.92% claimed that these are marketing tricks of pharmaceutical companies. The estimated efficiency of influenza vaccination in the event of illness caused by infection of the respiratory system at a value of 0.8 indicates that vaccinating all students could result in a significant protective effect. These calculations, however, should be taken with great caution, as such estimates are carried out for the purpose of meta-analysis as to calculate the collective performance indicato [7] and reports of type I-MOVE [8]. To get an accurate estimate one should analyze a far bigger number of respondents and with greater number of those vaccinated. Adopted confidence intervals at the 95% for the performance

Table 2. *Participation in giving the correct answer to the question in groups of students based on academic center.*

Question (correct answer)	The mount of correct answers obtained in specific groups of students								*p* value	% of correct answers in the whole population n = 1,031
	Cracow	Wroclaw	Szczecin	Łodz	Poznan	Lublin	Gdansk	Warsaw		
Inluenza vaccination in the season of 2014/2015 (getting inoculated)	3	5	9	6	25	13	5	10	p < 0.001	7.37
Mortality in the world every year due to influenza (0.5–1 million individuals)	52	38	57	45	49	33	38	24	p = 0.007	32.59
Influenza vaccination of children above 6 month of life (is beneficial)	24	22	34	38	38	40	23	41	p = 0.046	25.22
Vaccination of pregnant women against influenza (is beneficial)	11	10	18	16	31	27	19	29	p = 0.002	15.62
Optimal way of protection against influenza (vaccination)	43	19	40	29	59	38	34	39	p < 0.001	29.19
Optimal time of conducting vaccination against influenza (when the vaccine is available in pharmacy shops)	32	22	29	30	52	47	15	25	p < 0.001	24.44
The component of influenza virus in the vaccine against influenza (glycoproteins)	39	13	56	39	54	23	47	29	p < 0.001	29.1

indicator suggest that it is likely also that vaccination against influenza would have no effect on the formation of respiratory infections.

Table 3 shows the calculation on estimates of the effectiveness of influenza vaccination among medical students in the Medical Universities in Poland during the influenza season 2014/2015 compared with the incidence of upper respiratory tract infections in the early influenza season 2013/2014.

Discussion

By using the methods of continuous monitoring and epidemiological and virological surveillance over the influenza, it is possible to issue twice-yearly recommendations (separately for northern and southern hemisphere) a few months before the start of the influenza season. Such a system makes it possible to develop the composition, production and distribution of trivalent and tetravalent vaccines against seasonal influenza [9, 10]. The efforts we put into this system also including Polish system, do not translate into the level of knowledge about influenza prevention methods in society, in particular among the described group of medical students. It is necessary to introduce specific forms of training to conduct effective process of informing about the dangers of influenza, treatment of the source of infection, methods of cutting the channels of transmission of infection and the need to increase immunity against influenza. Such a systemic approach to the problem

Table 3. *The effectiveness of influenza vaccination.*

	Students who got inoculated against influenza (n = 76)	Students who did not get inoculated against influenza (n = 955)
Students who did not report in the questionnaire getting ill with influenza and influenza-like infections in the last season (n = 240)	19.73%	23.56%
Students who reported in the questionnaire getting ill with influenza and influenza-like infections (n = 791)	80.27%	76.44%
p = 0.02		
Odds Ratio OR (95% CI) = 0.8 (0.74–0.86)		

Table 4. *Data on cases and suspected cases of influenza and related numbers of hospitalizations and deaths in the seasons of 2000/2001–2014/2015 [9, 11].*

Season	Cases of inluenza and suspected cases of influenza	Hospitalisation	Deaths
2000/2001	587,322	748	2
2001/2002	214,081	261	1
2002/2003	1,227,852	3,154	25
2003/2004	344,772	1,119	5
2004/2005	700,798	1,352	5
2005/2006	283,231	418	0
2006/2007	355,326	730	0
2007/2008	243,591	142	0
2008/2009	562,443	2,200	0
2009/2010	855,127	7,949	177
2010/2011	1,061,391	5,470	187
2011/2012	1,066,238	3,289	1
2012/2013	2,989,041	13,837	119
2013/2014	2,761,522	9,374	15
2014/2015	3,774,795	12,227	11

seems particularly necessary as the epidemic season 2014/2015 in Poland ended with a score of more than 3.7 million cases and suspected cases of the influenza of more than 12.2 thousand hospitalizations and 11 deaths. That's 37% more cases and almost 50% more hospitalizations than in the season 2013/2014. Table 4 presents data on cases and suspected cases of influenza and related numbers of hospitalizations and deaths from influenza season 2000/2001 to 2014/2015

Established in 2013 Polish National Program for Combating Influenza, promotes influenza vaccination among the Polish population and tries to build up awareness of the need of prevention of this disease. It is also designed to monitor vaccination rates against influenza among doctors and future students of medicine. The indicator of vaccination rates in Poland for three years has remained at a constant low level and amounts to 3.7% of the population. Table 5 shows the estimated number of doses of influenza vaccines sold in the Polish market in the years 2004–2014 and the level of vaccination rates against influenza Polish population [5].

In Poland, a worryingly small percentage of individuals is inoculated against influenza among a group of future doctors and nurses, which is problematic as it is these individuals who will have frequent and direct contact with patients in future. Despite the appeals and recommendations of many expert organizations, inoculating of the medical staff against influenza remains low, it is estimated that among the medical staff it is 5–6%, and is only slightly higher than the state vaccinating indicator of the general population [11]. In the United States the core immunized against influenza of medical professionals ranges from 20% to 80% (on average of 40–50%) [12]. According to our research influenza inoculation was done by the population of 7.37% (76 individuals) out of 1,031 in the influenza season of 2014/2015. In response to the threat from influenza illness and its complications [13, 14], and the role that medical community should display in reducing transmission of influenza viruses in the population, the US Advisory Committee Vaccination (ACIP) presented a list of recommendations aimed at raising the level of vaccination rates against influenza among medical staff. Strategies to promote influenza vaccination should include, in particular important for medical students: education campaigns on influenza and vaccines (lectures, brochures, publications, Internet and traditional paper posters), which will describe the risk and complications of influenza and will also include information on effectiveness of vaccines against influenza their safety, the differences between the available describing the preparations and methods of prevention.

It seems that a good idea is an example of immunization coordinators and/or other such local leaders as leaders of student groups and the administrative requirement to undergo vaccination in order to be employed in a particular position. One should mention at least a few reasons why the prevention of influenza among medical staff is particularly important:

1. Due to contact with the sick and potentially infectious biological material, medical staff including medical students are particularly exposed to developing infectious diseases, including influenza.

Table 5. *Estimated number of doses of influenza vaccines sold in the Polish market in the years 2004–2014 and the level of vaccination rates against influenza Polish population.*

Year	Number of anti-influenza vaccine doses sold in the Polish market	The level of inoculability of the Polish individuals (%)
2004	2,305,045	6.0
2005	3,295,025	8.6
2006	2,930,656	7.7
2007	2,339,300	6.1
2008	2,164,783	5.7
2009	2,593,707	6.8
2010	1,990,507	5.2
2011	1,728,000	4.5
2012	1,411,000	3.7
2013	1,422,000	3.7
2014	1,424,000	3.7

2. Students of medicine and medical staff can be a source of infection for patients and staff.
3. Vaccinations against influenza are beneficial to employers, affecting the reduction in the number of days of 'sickness absence' among health professionals and for students an advantage in education and the lack of arrears due to illness and not attending classes.

In the process of raising vaccination rates, one must face the need to modify public attitudes towards vaccination against influenza. Therefore, commitment and a common voice of all those who have influenza is very important. These should include: individuals in public health institutions, health authorities, health professionals, local authorities and employers.

Considering the importance of chronic diseases and being involved in the mainstream activities of the World Health Organization (WHO), the Center for Disease Control and Prevention (CDC) and the European Alliance against Chronic Disease (ECDA), experts of the National Programme for Combating Influenza dedicated the year of 2015 to the fight against influenza complications which specifically endanger those who with chronic diseases of the circulatory system, respiratory system, kidney, liver and diabetes. In season 2014/2015 on the occasion of the second National Day of Prevention of Influenza in 21 cities throughout the country a free vaccination campaign against influenza in patients at risk was held. Banaszkiewicz et al. report in their study that the knowledge of the influenza acquired in a series of six years of medical training for medical students has little effect on the ratio of the influenza vaccination in this group of patients [15]. Future doctors have a reluctant attitude to influenza vaccination/inoculation. In the season 2014/2015 in the group of 721 medical students (Warsaw, Poznan, Wroclaw) the level of inoculation for students of the first and the last year was similar and amounted to 17.1% and 15.9%. The data obtained by the authors also confirm our analysis on the lack of knowledge and awareness of influenza and its prevention to a much larger group of medical students from various Medical Universities. The level of inoculation in the analyzed group was slightly higher than the level of inoculation of the entire Polish population in the epidemic season.

Our research shows that only a quarter of the surveyed students believe that influenza vaccination of young children over 6 months of life is beneficial to the children's health. Similarly is represented the calculation for the pregnant women. These vaccinations as beneficial for the health of the mother and child is only mentioned by 15.52% of students. Alarming is the fact that the question "Did you encourage to vaccination closest family/ friends/colleagues students?" is answered "definitely not" by more than 80% of subjects. This may testify to a very superficial knowledge of future doctors and the marginalization of the risks of illness derived from influenza. VENICE II program shows that Poland is one of the few European Union countries where the cost of vaccines is not reimbursed from public funds for children over 6 months of age, patients with chronic diseases, pregnant women and health care workers [16]. Our research shows that the tendency of aversion to vaccination on the example of the students is very high, because if they were available in Poland free, influenza vaccine would be desired by only 35.5% of respondents, undecided 32.4% and opponents of 32.1%.

Conclusion

The results of this study indicate that medical students at the beginning of their career have not fully established their virological knowledge, hence the need for intensified training of academic-based health education arises. All this should be done in order to raise awareness of influenza prevention with vaccination. Thanks to this the long-term planned action it will be possible to effectively conduct the policy of prevention and control of influenza infection in the environment of future doctors.

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[1] study design, [2] data collection, [3] statistical analysis, [4] data interpretation, [5] manuscript preparation, [6] literature search.
Conflict of interests:
The authors declare that they have no competing interests.
Financial support:
This study was partially funded by the authors.
Ethics:
The contents presented in this paper are compatible with the rules the Declaration of Helsinki, EU directives and standardized requirements for medical journals.

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